

What is Claimed Is:

1. A turbo-charged engine with EGR comprising a turbocharger having a turbine and a compressor, an EGR passage connecting an exhaust passage upstream of the turbine of the turbocharger and an intake passage downstream of the compressor to each other for returning some of exhaust gas in the exhaust passage to the intake passage, and an EGR valve provided in the EGR passage for adjusting a passage area of the EGR passage, wherein

capacity of the turbine is set such that in a high speed and high load region of the engine operating state, if the exhaust gas is supplied to the turbine with the EGR valve closed, the turbocharger overruns beyond a maximum speed limit, and if the EGR valve is opened to return the some of the exhaust gas to an intake passage side, the turbocharger rotates at less speed than the maximum speed limit.

2. The turbo-charged engine with EGR as defined in Claim 1, further comprising a control device for opening the EGR valve in a region that the turbocharger overruns beyond the maximum speed limit.

3. The turbo-charged engine with EGR as defined in Claim 1, wherein the turbocharger has a high stage turbine and a low stage turbine provided in series in the exhaust passage of the engine, and a high stage compressor and a low stage compressor provided in series in the intake passage of the engine and respectively driven by each of the turbines, and the EGR passage connects the exhaust passage upstream of the high stage turbine and the intake passage downstream of the high stage compressor to each other.

4. The turbo-charged engine with EGR as defined in Claim 3, wherein capacities of the high stage turbine and the low stage turbine are respectively set such that in the high speed and high load region of the engine operating state, if the exhaust gas is supplied to the high stage turbine with the EGR passage closed, at least one of the high stage turbine and the low stage turbine overruns beyond the maximum speed limit, and if the EGR passage is opened to return the some of the exhaust gas to the intake side, both of the turbines rotate at less speed than the maximum speed limit.

5. The turbo-charged engine with EGR as defined in Claim 1, further comprising a charge cooler for cooling intake air, which is provided in the intake passage and located at downstream side of a position to which the EGR passage is connected.
6. The turbo-charged engine with EGR as defined in Claim 1, wherein an EGR cooler for cooling EGR gas is provided in the EGR passage.
7. The turbo-charged engine with EGR as defined in Claim 6, wherein the EGR cooler is provided in the EGR passage downstream side of the EGR valve.
8. The turbo-charged engine with EGR as defined in Claim 1, wherein a check valve is provided in the EGR passage to allow a flow only in a direction from the exhaust passage to the intake passage and to prevent the flow in an opposite direction thereof.
9. The turbo-charged engine with EGR as defined in Claim 8, wherein the check valve is provided in the EGR passage downstream side of the EGR valve.
10. The turbo-charged engine with EGR as defined in Claim 1, wherein an EGR cooler for cooling EGR gas is provided in the EGR passage, and a check valve is provided in the EGR passage downstream of the EGR cooler to allow a flow only in a direction from the exhaust passage to the intake passage and to prevent the flow in an opposite direction thereof.
11. The turbo-charged engine with EGR as defined in Claim 1, wherein the engine is a multi-cylinder engine and has an exhaust manifold and an intake manifold at least one of which is divided into two or more, wherein each parts of the divided exhaust manifold or intake manifold are individually connected to the divided or not divided intake manifold or exhaust manifold by two or more of the EGR passage such that when one cylinder involved in the exhaust manifold to which a certain EGR passage is connected is in exhaust stroke, another cylinder involved in the intake manifold to which the certain EGR passage is connected is in intake stroke.

12. The turbo-charged engine with EGR as defined in Claim 1, wherein the engine is a multi-cylinder engine and has an exhaust manifold divided into two or more, wherein each parts of the divided exhaust manifold are individually connected to the intake passage by two or more of the EGR passage.

13. The turbo-charged engine with EGR as defined in Claim 1, wherein the engine is 6-cylinders engine and has an exhaust manifold, combustion order of each cylinders is No.1, No.5, No.3, No.6, No.2 and No.4, the exhaust manifold is divided into a first exhaust manifold gathering No.1-3 cylinders and a second exhaust manifold gathering No.4-6 cylinders, and the EGR passage comprises a first EGR passage connecting the first exhaust manifold and the intake passage to each other and a second EGR passage connecting the second exhaust manifold and the intake passage to each other.

14. The turbo-charged engine with EGR as defined in Claim 13, wherein the first EGR passage and the second EGR is gathered to connect to the intake passage.

15. The turbo-charged engine with EGR as defined in Claim 13, wherein the EGR valve, an EGR cooler and a check valve are provided in series in each of the first EGR passage and the second EGR passage.